

Science & Technology cum Entrepreneurship Applications in Enhancing Agriculture, Forestry and Natural Resources (AFNR) Curriculums

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Abstract

Science & Technology cum Entrepreneurship Applications in Enhancing Agriculture, Forestry and Natural Resources (AFNR) Curriculums is curriculum enhancement intervention executed through “hands-on” internship across AFNR courses in three State Universities and Colleges in Region IX. Its four components (Coconut Sugar, Seaweeds, Tissue Culture and Rubber Seedlings) operate on experiential and pragmatic approach to enhancing the competence and institutional employability of AFNR students through S&T applications, acquisition of entrepreneurial skills and microenterprise development focusing on Zamboanga Peninsula’s major dollar-earning export commodities. The immersion of 362 student-interns has developed their technical and entrepreneurial skills that can match the requirements of AFNR industries which they can also use to start microenterprises should they opt for self-employment after graduation. The project is also able to reverse the declining enrollment in AFNR courses in Region IX. From School Year 2007-2008 to School Year 2010-2011, the project is one of the factors that contributed to the overall three-percent increase in enrollment in AFNR courses in the three participating SUCs in the region. As a result of the student-internship program, the four commodities produced by AFNR students are sold through grocery stores and directly to “walk-in” buyers, traders, farmers, local government units, non-government organizations.

1. INTRODUCTION

*Science & Technology cum Entrepreneurship Applications in Enhancing Agriculture, Forestry and Natural Resources (AFNR) Curriculum*s (WMSU-AFNR Project 3.1) reinforces Zamboanga Peninsula (ZamPen) Regional Development Plan via higher education capability building initiative with anticipated impact in the agriculture and employment sectors and contribution to poverty reduction especially in the rural areas. The project is a university-based and student-centered internship in S&T cum entrepreneurship education focusing on enhancing the technical skills, competence and institutional employability of AFNR students through S&T applications and entrepreneurial skills acquisition in agri-based production and processing technologies, product standardization, quality improvement and overall management and development of financially viable micro and small enterprises along the region's major dollar-earning export commodities. These involve food items (coconut sugar, coconut honey and coconut jelly), additive to industrial and medical products (carrageenan produced from dried seaweeds) and planting materials for rubber plantations (budwood and seedlings) and banana farms (tissue cultured banana plantlets and seedlings). It also serves as the venue for "hands on" S&T cum entrepreneurship-based laboratory exercises and in-campus internship or on-the-job training (OJT) program. Through the project, the 362 AFNR student-interns—the main beneficiaries—produce 10 different product lines available for sale to interested buyers: coco sugar, jelly, jam, wet and dried seaweeds, rubber budwood and seedlings, tissue cultured plantlets and seedlings.

The project's sustainability across the three implementing State Universities and Colleges (SUCs) in ZamPen relies on the absorptive capacity and financial viability of the existing IGPs. After December 2010, WMSU-AFNR Project 3.1 is now integrated with regular IGPs and the internship components of the AFNR curricula of the three largest SUCs in Region IX such that the project is now under the supervision of Business/IGP Units. Additional investments to continue, expand or sustain project operations beyond the DOST-funded AFNR program will already come the budget of the SUCs or from the project's gross income which is currently deposited in the special trust funds of Western Mindanao State University (WMSU), Jose Rizal Memorial State University-Tampilisan Campus (JRMSUT) and Zamboanga State College of Marine Sciences and Technology (ZSCMST).

2. EDUCATION, SCIENCE AND TECHNOLOGY, AND ENTREPRENEURSHIP

Sectoral interdependence among these primary drivers of economic development is largely anchored on higher education providing the training ground and the capability enhancement tools thereby enabling graduates and students to acquire the knowledge, skills, attitudes and practices necessary for the advancement, applications and utilization of S&T, generation of profit-maximizing values from S&T-based commodities, and greater financial yields for the economic agents such as the "entrepreneur." The importance of science and technology (S&T) as key drivers of growth is stressed in economic theory, especially endogenous growth theory as well as in many economic/development strategies of countries or group of countries (Bucar 2010:5). The survey of Vanessa Peña, et. al., (2010:3) cites Klaus Schwab, Founder and Executive Chairman of the World Economic Forum, stressing that entrepreneurship is the engine fuelling innovation, employment generation, and economic growth.

In the Philippines, an effective university-industry match in these agricultural commodities and technologies ensures that AFNR students and graduates are able to learn and acquire the skills that perfectly fit the requirements of the industry. When agricultural curricula are similarly focused on

regional flagship commodities, the universities are better able to respond adequately to the industry's demand for skilled manpower. A strong academic orientation and practical experiences on the region's flagship commodities (production, processing and entrepreneurship) ensures that knowledge and skills of agriculture graduates actually match the needs of the industry. In this way, well-trained graduates will be in a better position to positively contribute to the improvement and productivity of the agri-fishery industry.

3. AGRICULTURE SITUATIONER AND REGIONAL DEVELOPMENT: ZAMBOANGA PENINSULA (REGION IX)

ZamPen is primarily an agricultural region. NEDA Region IX reports that in year 2009, the primary regional economic growth driver was the Agriculture and Fishery in the Agriculture Sector. While remaining to be the primary driver of the regional economy contributing about half of its total employment and output, the Agriculture Sector's contribution to gross regional output is declining from 53.3 percent in 2001 to 48.7 percent in 2008. The 2009 Regional Development Report for Zamboanga Peninsula (NEDA IX:3-7) shows a net 6.7% decline in the total enrolment in Agriculture, Forestry and Fisheries courses from 1,122 in SY 2008-2009 to 1,047 in SY 2009-2010. Moreover, total enrolment in AFNR courses for SY 2009-2010 represents only 1.73% of the total number of 60,356 students enrolled in various disciplines in different higher education institutions in Region IX. Overall, ZamPen's total enrollment in higher education institutions dropped by 22.3% from a total of 77,662 to 60,356 students enrolled in various disciplines for the same period. This declining enrollment in the AFNR courses is a national phenomenon with other regions experiencing drops in enrollment every school year. The national government has officially recognized this as an alarming situation needing immediate solution to be implemented nationwide.

3.a. ZamPen's Major Export Commodities

The 2009 Regional Development Report for Zamboanga Peninsula (NEDA IX), identifies the top five (5) major/champion crops produced in 2009 include: coconut at 1,744,738.04 M.T. followed by banana at 261,081.43 M.T., rubber at 164,293.44 M.T., mango at 57,509.36 M.T. and cassava at 30,416.06 M.T. Moreover, the fisheries sub-sector is considered as one of the major contributors to the regional economy. The region is endowed with rich fishing grounds and with rich fish and aqua-marine resources. The year 2009 saw a 13.62 percent increase in fisheries production. From its level of 644,386 metric tons in 2008 it increased to 732,146 metric tons or by 13.62 percent. Commercial fishing remains to be the leading contributor of the fishery sector with a production of 357,429. It also manifested the highest increase of 28.93 percent over the previous year's production. This was followed by the aquaculture subsector which contributed 247,634 metric tons. Moreover, while the Philippines is identified by the Food and Agriculture Organization (2005) as the world's top exporter of raw and processed seaweeds or carrageenan, the ZamPen region, according to BFAR (2008), is also one of the country's top seaweeds producer.

Coco Sugar—Based on a 2007 Food and Nutrition Research Institute (FNRI) study, the glycemic index (GI) of coconut sap sugar was 35; hence it is classified as a low-GI food, which can be used as natural sweetener for diabetics. A low-GI food will cause a small rise in blood glucose level, while a high-GI food will trigger a dramatic spike (Manila Bulletin, 29 April 2008).

Seaweeds—In 1999, about one million Filipinos, mostly Muslims, have directly benefited from the country's seaweed farming industry producing 700,000 tons of dried seaweeds worth 129 million USD. The thrust for the seaweed development is to increase production through improvement of culture techniques, postharvest and processing activities for a sustainable economic activity among cultural minorities engaged in seaweed production as a livelihood in Region 9 as a priority area of support in Mindanao.

Rubber—Agriculture Secretary Domingo F. Panganiban, on the other hand, stated that the DA strives to increase rubber production by 10 percent annually to expand our market. It also recommends integrated farming systems approach to achieve a 10 percent yearly raise in the income of rubber smallholders (Mojica 2008).

Tissue Culture—Large-scale micropropagation laboratories are providing millions of plants for the commercial ornamental market and the agricultural, clonally-propagated crop market. With selected laboratory material typically taking one or two decades to reach the commercial market through plant breeding, this technology can be expected to have an ever increasing impact on crop improvement. (Brown and Thorpe 1995).

4. WMSU-AFNR PROJECT 3.1

WMSU-AFNR Project 3.1 is a university-based and student-centered internship in entrepreneurship education cum S&T applications in the processing and production, management as well as marketing of food items (coconut sugar, coconut honey and coconut jelly), additive to industrial and medical products (carrageenan produced from dried seaweeds) and planting materials for rubber (budded rubber seedlings) and banana (tissue cultured plantlets and seedlings) plantations.

The project aims to achieve three objectives:

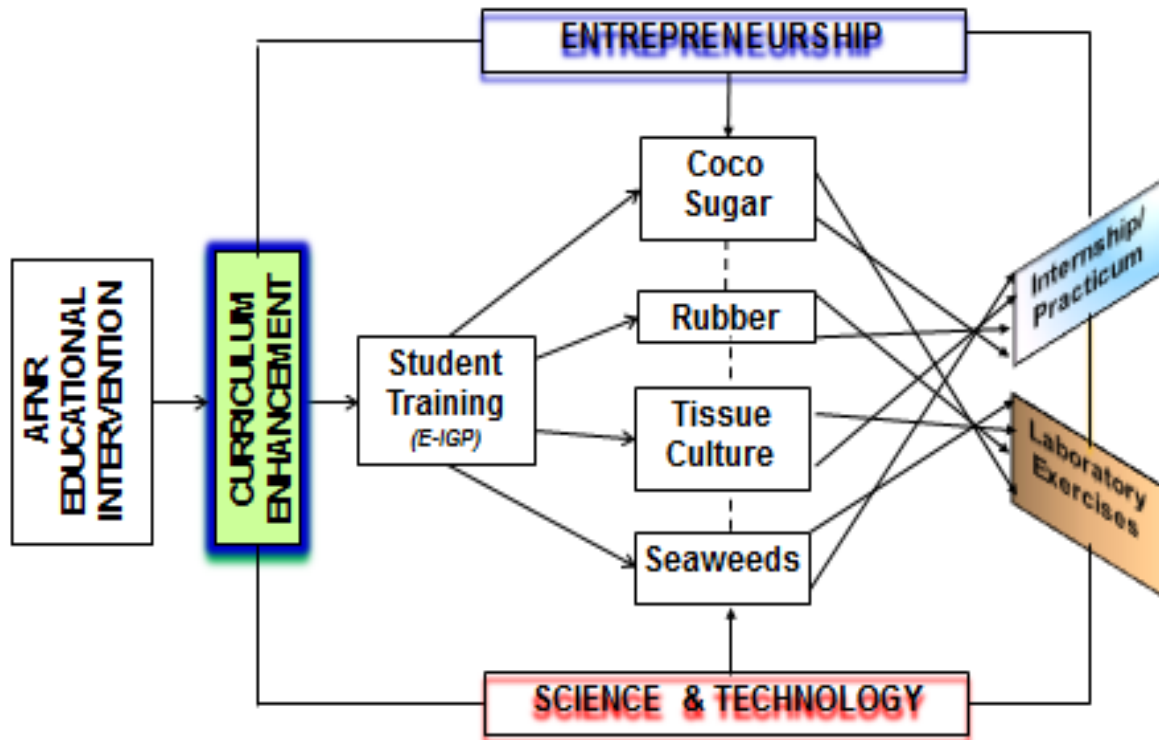
1. To provide practical and hands-on learning experiences to AFNR students on the integration of S&T and entrepreneurship;
2. To increase enrollment in AFNR courses by improving the employability of AFNR graduates thru technical and managerial internship in S&T-and-agri-based enterprises; and
3. To use the Project as a site and a demo farm for the hands-on learning experiences in terms of application and testing of technologies and improve technical know-how and entrepreneurial abilities of AFNR students and unemployed graduates as well as develop the local production, processing and entrepreneurship/income-generating capabilities of the SUCs in the ZamPen region.

4.a. Conceptual Framework

The project's conceptual framework is operates on the experiential and pragmatic approach to the enhancement of the competence and institutional employability of AFNR students and graduates through application of S&T and acquisition of entrepreneurial skills in agri-based as well as home-based production and processing ventures, product standardization, quality improvement and overall management and development of financially viable microenterprises along the region's agricultural flagship and champion as well as major dollar-earning export commodities. It also served as the venue for "hands on" S&T cum entrepreneurship-based laboratory exercises and in-campus internship or on-the-job training (OJT) program. The AFNR students were given respective responsibilities and accountabilities in all aspects of the operations, management and development of each of the ten students' Income-

Generating Project (IGPs) or micro-enterprises: production and operations, sales and marketing, credit and collection, accounting and auditing as well as the overall financial management.

AFNR Project 3.1 Conceptual Framework



5. METHODOLOGY

The main implementation methodology used in the WMSU-AFNR Project 3.1 is internship—which is a form of training—through deployment of AFNR students in the operations, production, marketing and overall management of four projects that produce coco sugar, seaweeds, rubber seedlings and banana plantlets/seedlings for sale to interested buyers.

Students’ internship officially started after completion of pertinent trainings of selected AFNR students in the four sub-projects (coco sugar, seaweeds, rubber and tissue culture). While trainings are on-going, all project staff prepared all the inputs necessary for the internship especially the raw materials to be used in the production and processing as well as marketing linkages and tie-ups with different government, non-government and business organizations in the locality.

WMSU-AFNR Project 3.1 was implemented as guided by four major criteria that blend the elements of S&T application and utilization with entrepreneurial activities in the administration of curriculum enhancement via the training/internship program in educational income-gerating projects (E-IGP) for AFNR students in three SUCs in the Zamboanga Peninsula region (Region IX).

6. RESULTS

Results and observations are laid down in accordance to the objectives of the project. Overall outcomes of the project across the participating SUCs in ZamPen are well-appreciated by university officials due to the availability of funds which enable them to easily acquire the raw materials to be used in the establishment of enterprise and the processing of target commodities into products with higher economic value. Since employment in the industries may be limited, the graduates are well-equipped with knowledge in examining available employment alternatives in their respective communities and in maximizing the use of locally available resources for self-employment options or entrepreneurship.

Objective #1. To provide practical and hands-on learning experiences to AFNR students o the integration of Science and Technology (S&T) and entrepreneurship.

WMSU-AFNR Project 3.1 has immersed a total of 362 students from the three SUCs in ZamPen, thereby accomplishing 139 percent of the 260 target number of student-interns. The immersion covers S&T application in terms of processing the four commodities (coco sugar, seaweeds, rubber and tissue cultured bananas) into products that can be sold directly to interested buyers. During the immersion are also exposed to some entrepreneurial exercises such as institutional and direct selling and bookkeeping and accounting. Student-interns produce all the products currently available for sale in WMSU, ZSCMST and JRMSU-Tampilisan. Entrepreneurial activities during internship are done in the last phase and after production of the marketable products. Interns were assigned to contact possible buyers and discuss the possibility of their becoming a supplier of the commodity. The easier task for the interns is direct selling of the products to interested buyers.

Actual exposure and immersion of AFNR students in all the operational aspects of the sub-components for one semester and enabling them to apply the process and technology learned during the trainings provides the “hands-on” learning experiences of the students in the S&T applications. On the other hand, their actual direct selling activities of the processed products gave them sufficient confidence in the entrepreneurial aspects of their internship. Across the four sub-components, student-interns perform actual tasks in processing, marketing, selling and other procedures:

1. Coco Sugar—harvesting toddy, cooking, drying, pulverizing, packing, selling.
2. Seaweeds—area preparation, planting, harvesting, drying, packing, selling.
3. Rubber—budwood preparation and care, transplanting, nurturing and growing of seedlings, selling.
4. Tissue Culture—laboratory tasks in mixing chemicals, extracting parts of the mother plants which can be grown to plantlets, caring of plantlets under laboratory conditions, and transplanting and other nursery activities for growing banana plantlets into seedlings and selling of plantlets and seedlings.

Student Immersion—When the 362 AFNR student-interns immersed in the four components were grouped according the degree programs the students were taking in the SUCs, the biggest group of interns immersed in the project were the students taking up Diploma in Agricultural Technology (DAT)/Bachelor of Agricultural Technology (BAT). However, the highest percentage of accomplishments came from the BS Fisheries group as a result of the lower target assigned to BS Fisheries in the conceptualization and planning stages of the project (Table 1).

Table 1
Student-Interns Immersed by Course

Course	Target	Actual	Percent (%) Accomplishment
BS Aquaculture	10	13	130
BS Fisheries	8	77	963
BS Marine Biology	7	22	314
BS Marine Technology	60	50	83
BS Agriculture	50	50	100
BS Agribusiness	50	30	60
Diploma/Bachelor of Agricultural Technology	70	110	157
BS Agricultural Engineering	5	10	200
Total	260	362	139

When the number of AFNR student-interns immersed in the four components were grouped according to commodity or project component, the largest number of students who were immersed in seaweeds farming, processing, marketing and selling were in the seaweeds commodity (167 students), which is 139 percent higher than the expected output (Table 2).

Table 2
AFNR Student-Interns Immersed by Commodity

SUC	Total		Percent (%) Accomplishment
	Target	Actual	
Coco Sugar (WMSU)	80	82	102
Tissue Culture (WMSU)	40	77	192
Seaweeds (ZSCMST)	70	167	239
Rubber (JRMSU-T)	70	36	51
Total	260	362	139

The actual exposure of the 362 AFNR student-interns in the technical, marketing and microenterprise development and management in the four components has developed their confidence in the replication of their experiences when they graduate from college and make use of this experience as a take-off point for improving their income-generating capabilities when they return to their respective communities. Moreover, the project has given the student-interns an edge over other students in terms of knowledge, field experience and practical skills when they will apply for employment in the industries and corporations.

Production, Sales and Inventory—The project has produced different products that are ready for sale valued at Php807,254.00 as of March 31, 2011. Sales, however, was Php220,814.00 which represents on 27.4 percent of the total value of goods produced (Table 3). As a result of the AFNR student-internship program, the more popular products with very limited supply (i.e., coco sugar) are now produced by AFNR students and sold directly to interested buyers and in the grocery sections of Shopping Centers in Zamboanga City. Coco sugar is readily saleable in retail direct to consumers while seaweeds is sold normally to dried seaweeds traders in Zamboanga City. Budded rubber seedlings, on the other hand, are sold to buyers who own rubber plantations in Zamboanga del Norte and Zamboanga Sibugay provinces. Tissue cultured banana seedlings are sold direct to plantation owners and the Department of Agriculture.

Rubber and tissue cultured banana seedlings are similarly sold to “walk-in” buyers especially local farmers and businessmen who frequently visit the SUCs in search of planting materials for their respective farms.

Table 3
Total Production, Sales and Inventory of Products under WMSU-AFNR Project 3.1

Item Sold	Selling Price/ Unit	Total Quantity Produced	Value of Production (PhP)	Quantity Sold	Total Sales (PhP)	Performance (% of sales to production)
Coco Sugar	Php200/kg	858.62kg.	171,724	446.87kg	89,374	52%
Coco Jelly	Php40/bot	100 bots	4,000	4,000 bots	4,000	100%
Coco Honey	Php35/bot	150 bots	5,250	5,250 bots	5,250	100%
Seaweeds	Php50/kg	161 kgs	8,050	69 kgs	3,450	43%
Rubber Seedlings	Php15/pc	30,000 (seedlings to be budded)	450,000	2,168 budded seedlings	65,040	15%
Tissue Cultured Banana seedlings	Php25/pc	5,591 seedlings	139,775	2,148 seedlings	53,700	38%
Tissue Cultured Banana plantlets	Php5/pc	5,691 plantlets in laboratory	28,455	-	-	-
Total			807,254		220,814	27.4%

Objective #2. To increase enrollment in AFNR courses by improving the employability of AFNR graduates through technical and managerial internship in agri-based enterprises with high S&T content.

The project is able to slightly enhance the AFNR curriculum and improve enrollment in AFNR courses in the three SUCs (Western Mindanao State University, Zamboanga State College of Marine Sciences and Technology and Jose Rizal Memorial State University-Tampilisan Campus). WMSU registered the largest increase (+56 percent) in the number of AFNR students among the three implementing SUCs while JRMSU-Tampilisan has the largest decline in the number of AFNR students (-33 percent) as shown in Table 4. The declining trend reveals that the decline in enrollment in the AFNR courses will continue unless the Philippine government is able to find a solution to this problem. While the AFNR is an excellent initial step to reverse this trend, there could be other factors which have more significant impact and had greatly contributed to this problem.

Table 4
Trend in AFNR Enrollment in Region IX (Year 2008-2011)

SUC	SCHOOL YEAR				Inc(+)/Dec(-) (SY 2008-2009 vs. SY 2010- 2011)
	SY 2007- 2008	SY 2008- 2009	SY 2009- 2010	SY 2010- 2011	
WMSU	196	222	240	305	+56
ZSCMST	387	390	391	372	-5
JRMSU-T	272	228	170	147	-36
Total	1,055	802	801	824	+3

Objective #3. To use the Project as a site and a demo farm for the hands-on learning experiences in terms of application and testing of technologies and improve technical know-how and entrepreneurial abilities of AFNR students and unemployed graduates as well as develop the local production, processing and entrepreneurship/income-generating capability of the SUCs in the ZamPen region.

The project sites provided the venue, raw material inputs, technology, business dimensions and the guidance of trained faculty members who devoted their time and efforts for the enhancement of the knowledge and skills of the AFNR student-interns and made them ready to face the employment and challenges prior to their graduation. Moreover, the internship in WMSU-AFNR Project 3.1, they have acquired the necessary technical skills needed by the agriculture-based industries in the region. The project also developed the technical skills and entrepreneurial spirits of the AFNR interns and other students in the three largest State Universities and Colleges in the ZamPen region. Their practical and hands-on experiences in S&T applications via processing and production of the four different priority crops honed their technical skills, to a certain extent while actual marketing, negotiation and direct selling had developed their familiarity with business and entrepreneurial undertakings which are useful in the continuous effort for improvement of the socio-economic status.

Coco Sugar Student's Enterprise—Science and technology application in the processing of fresh coconut sap into coco sugar is a new technology developed by the Philippine Coconut Authority-Zamboanga Research Center (PCA-ZRC). Together with entrepreneurial trainings, the interns were able to identify prospective buyers and make analysis of actual and real financial records.

Production of Tissue Cultured Banana Plantlets and Seedlings—The tissue culture of banana is a form of biotechnology which allows the mass production of planting materials under laboratory conditions. Plantlets which can be bought from the tissue culture laboratory can now be grown to seedling stage in the backyard and then sold at a higher price. Thus, this can provide a viable livelihood for AFNR graduates and their families.

Budwood Garden and Budded Rubber Seedlings—The AFNR interns for rubber were not surprised by AFNR because most of their laboratory classes have rubber production contents. The WMSU-AFNR Project 3.1 rubber component clearly enhanced what most of the students are already familiar with and added a new dimension into marketing and financial management skills to BS Agriculture students.

Student's Deep Sea Seaweeds Production Enterprise—Many Muslim students of the Zamboanga State College of Marine Sciences and Technology (ZSCMST) were sent to the college by their parents through the income derived from seaweeds farming. The infusion of additional resources from WMSU-AFNR Project 3.1 provided actual and practical exposure to their AFNR students in the S&T application for deep sea seaweeds farming, processing and selling. Dried seaweeds is relatively easy to sell because of the presence of numerous traders and seaweeds processing plants in Zamboanga City.

7. FINANCIAL PERFORMANCE

While the entire project was able to produce different product lines with an estimated value of Php807,254.00, this represents only 21 percent of the total approved budget (Table 5). Actual sales for the 18-month period amounted to Php220,814.00 which represents only a much lower 6 percent of the total budget (DOST-GIA and SUCs counterpart). The financial analysis shows that the project did not

attain its financial viability objective as a result of the subsidy given to the project in the form of honoraria for SUCs personnel assigned to the project as identified and approved by PCARRD. This subsidy increased the production and reduced the net profit for the project. It is recommended that computations on the actual financial statements should only include the honorarium of the Component/commodity Coordinator; not the project staff identified by PCARRD.

Table 5
WMSU-AFNR Project 3.1 Financial Performance by Component/Commodity

Commodity/Component	Selling Price/ Unit	Value of Goods Produced (PhP)	Total Sales (PhP)	Value of Inventory (PhP)	APPROVED BUDGET (PhP)			FINANCIAL PERFORMANCE INDICATORS				
					DOST-GIA	ZamPen SUCs	Total	% of sales vs. production	% of inventory vs. production	% of sales vs. Total Budget	% production vs. DOST-GIA	% production vs. Total Budget
					(E)	(F)	(G)	(C) = (B)	(D) = (B)	(C) = (G)	(B) = (E)	(B) = (G)
Coconut Sugar, Jelly & Honey	PhP200/kg	180,974.00	98,624.00	82,350.00	642,078.30	273,780.00	915,858.30	54%	46%	11%	28%	20%
Seaweeds	PhP50/kg	8,050.00	3,450.00	4,600.00	382,079.39	24,080.00	636,169.39	43%	57%	1%	2%	1%
Rubber Seedlings (for budding)	PhP15/pc	450,000.00	65,040.00	384,960.00	679,892.51	488,300.00	1,168,192.51	14%	86%	6%	66%	39%
Tissue Culture (Banana plantlets & seedlings)	PhP5 & 25/pc	168,230.00	53,700.00	114,530.00	274,837.80	488,300.00	758,137.80	32%	68%	7%	61%	22%
Administrative Support Services Honoraria					-	387,000.00	387,000.00					
Total		807,254.00	220,814.00	586,440.00	1,988,888	1,871,460	3,860,348	27.35%	73%	6%	41%	21%
Cost-sharing Scheme (DOST-GIA versus ZamPen SUCs Counterpart Fund)					52%	48%	100%					

8. SUSTAINABILITY

The sustainability plan for the four components capitalizes on the re-investment of sales (current and sales to be generated later when inventory will be sold) as new working capital for the succeeding cycles of project operations under the Income-Generating Projects/Corporate Units of WMSU, JRMSU-Tampilisan and ZSCMST. Income from project operations is sufficient to cover the budgetary requirements of the succeeding production cycles for at least three years after 2010. Furthermore the project's activities were fully and comprehensively integrated into the four organizational mandates of WMSU, ZSCMST and JRMU-Tampilisan (e.g., instruction, research, extension and production/IGP).

Instruction—SUCs will continue the internships and laboratory exercises across the four commodities and improve the processes by which students will generate their own income from their internship especially for the (BS Agribusiness, DAT/BAT, BSA, BS Agricultural Engineering, BS Fisheries, BS Marine Biology and other AFNR students every school year.

Research—Priority commodities under the AFNR program will be included in the Research and Development Agenda of the SUCs and in-house research funding will be lobbied and generated from R&D budget of the SUCs. The three SUCs will utilize the existing facilities in the proposed research activities from 2011 to 2016 as identified in the Regional Science & Technology Agenda for Region IX.

Faculty and Students will be assigned to conduct research activities every year on the following related topics in collaboration with other WESMARRDEC and other Consortium agencies:

- Development and performance evaluation of new & improved varieties of seaweeds, forest trees, coconut (source of coco sugar), rubber, seaweeds and tissue cultured banana, abaca and other crops suitable under adverse conditions in the region
- Prevention of rapid multiplication & disease indexing of planting materials
- Processing of commodities into food items (product development, packaging, etc.), genetic improvement and disease control for rubber seedlings, banana and seaweeds and other food and alternative uses
- identification of new market and supply chain management for agricultural commodities and processed food items from the region

Extension and Community Service—To implement the proposed extension program of the University trainings for tissue culture, coco sugar production, rubber budwood production and seaweeds production as well as concomitant improvement of livelihood options and activities via entrepreneurship trainings to be provided to different clients of the community and other farmers' and fishermen's groups based on the request of LGU, academe, other government and private agencies.

Production/Income-Generating Projects (IGP)—Production of the commodities previously under the AFNR project (coco sugar, banana tissue cultured seedlings, rubber budded seedlings and seaweeds) will continue with the budget coming from the Special Trust Fund under the Income-Generating Project/Business Units of the SUCs. The income generated from AFNR 3.1 will be re-invested and used as working capital in the succeeding cycles beginning School Year 2011-2012 and every school year thereafter.

9. SUMMARY AND CONCLUSION

The project has immersed 362 AFNR student-interns from the three SUCs. The immersion has developed the technical and entrepreneurial skills of the interns that can match the requirements of the AFNR industries in the region which they can also use to start a financially viable livelihood or income-generating micro-enterprise in their respective communities should they opt for self-employment after graduation. Entrepreneurial skills learned by the students boosted their confidence in making a financially rewarding livelihood from the products of S&T application in the four champion commodities of the region—coconut, rubber, seaweeds and banana. All products of S&T applications in the four commodities were sold and have ready market in the different provinces and cities of Zamboanga Peninsula.

The SUCs provided a counterpart fund of Php1,871,460.00 or 45 percent of the total project cost of Php3,860,348.00 with DOST-GIA of Php1,988,888.00 or 55 percent of the total project cost. The estimated value of the goods produced by the project amounted to Php807,254.00 with total sales amounting to Php220,814.00. The remainder of Php586,440.00 is tied up to the inventory of different product lines waiting to be sold at the right time and at the saleable stage.

Since the S&T application and entrepreneurship in the four commodities of WMSU-AFNR Project 3.1 were already integrated in the different AFNR courses in the three SUCs, faculty members handling the concerned courses will now be required to regularly (every semester) include the AFNR

commodities (S&T application and entrepreneurship) in the lecture and laboratory classes of AFNR courses. Actual and practical trainings will be financially supported by the funds generated from the sales of the processed and sold products. For School Year 2011-2012, sales from the operations will be used to finance the educational income-generating projects (e-IGP) of AFNR student-interns across curriculum and across the three participating SUCs in the region.

10. PROBLEMS ENCOUNTERED

The project is able to overcome administrative bottlenecks and other problems encountered during implementation. While these problems caused delays, the project is able to continue operations and all deliverables are completed as scheduled in December 2010. The following are some of the problems encountered:

1. Very slow government procurement procedures & accounting & auditing rules.
2. Student-interns cannot cope up with targets which were based on full-time and wage-earning workers.
3. Raw material supply problem.
4. Delayed trainings (pre-requisite for immersion) under Project 2 resulted in low production outputs as a consequence of shortened duration for the immersion.

11. RECOMMENDATIONS

1. All heads of offices involved in project operations be included in the workshop prior to the start of project operations focusing on how they can help expedite the slow procurement and accounting and auditing procedures.
2. Profit-oriented projects should be channeled through the employees association or cooperatives where procurement processes can be expedited to adequately respond to the required speed in transaction processing that are more business-friendly.
3. The project should be placed under the Agribusiness or Income-Generating Projects or Corporate units of the SUCs and project income should be placed under a Special Trust Fund and be re-invested as working capital in the succeeding operations especially beyond the duration of the WMSU-AFNR Project 3.1.

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